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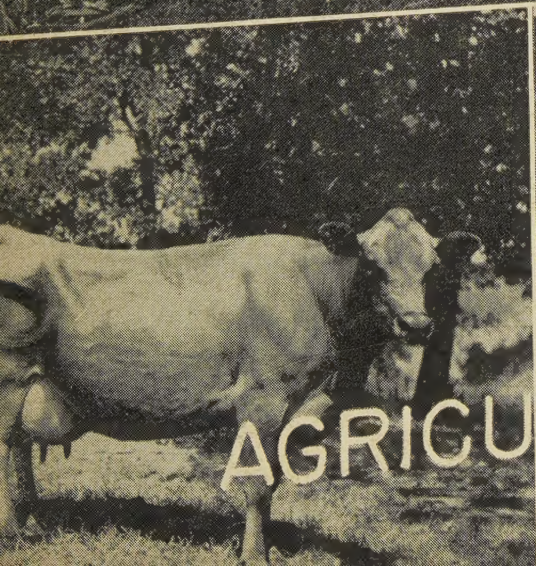
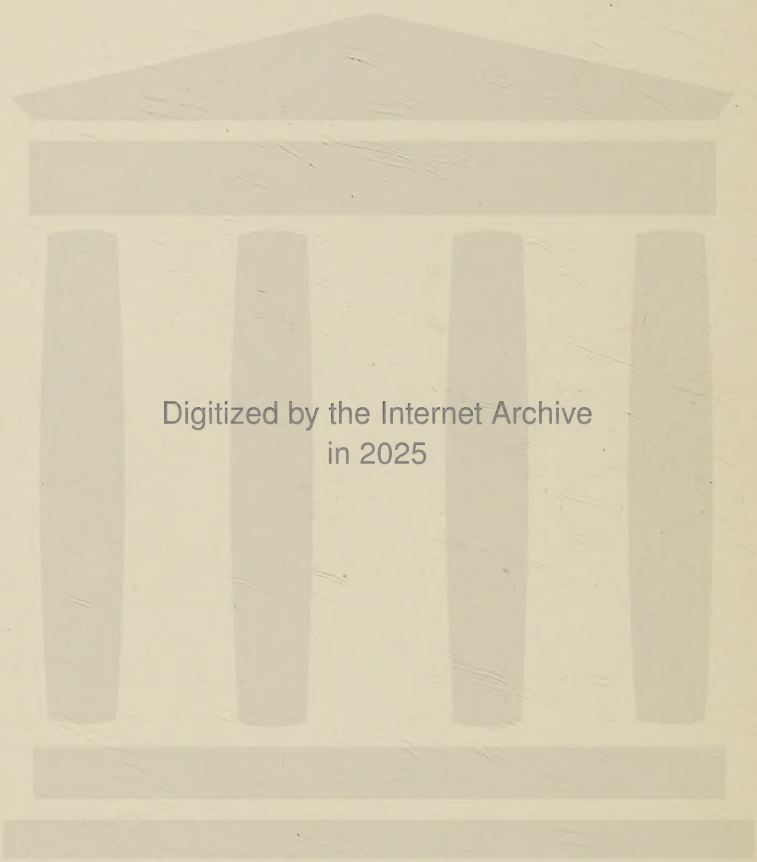


AGRICULTURE



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TEXAS AGRICULTURAL EXPERIMENT STATION

C. H. McDOWELL, Acting Director

College Station, Texas

FIFTY-SEVENTH ANNUAL REPORT

1944

RESEARCH SERVES AGRICULTURE

AGRICULTURAL AND MECHANICAL COLLEGE OF TEXAS

Gibb Gilchrist, President

E73-745-8M-L180

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July 1, 1945

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*In coop. with U. S. D. A.
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The Texas Agricultural Experiment Station at the Agricultural and Mechanical College of Texas, College Station, Texas, with its eighteen sub-stations and ten field laboratories located in the principal agricultural regions of the State, directly serves Texas agriculture.

In this report only a few of the latest accomplishments and services are mentioned and illustrated. Many other developments by the Texas Agricultural Experiment Station wherein research serves agriculture could be mentioned. For example, a wealth of information has been developed on citrus and vegetable production; on the control of plant and animal insects and diseases; on nutritive values in foods and feeds; on new strains of cotton, corn, wheat, flax, legumes, fruits, berries, and other crops; on soils and fertilizers; and on many other subjects vital to agriculture in the State.

With the many changes that are being brought about by the War and the great demands for food, feed, and fiber so necessary for our victory and for freedom in world peace, it is imperative that we base our procedure upon established facts. To this end agricultural research stands ready to serve.

RESEARCH SERVES AGRICULTURE

FIFTY-SEVENTH ANNUAL REPORT—1944

TEXAS AGRICULTURAL EXPERIMENT STATION

By

C. H. McDowell, Acting Director

Texas Broad Breasted Turkey

Body-Balance is Essential to Successful Mating

The popularity of the Broad Breasted turkey is increasing very rapidly but trouble has been experienced by some breeders because too many eggs are infertile. This is because the birds are not well-balanced and they can not mate satisfactorily.

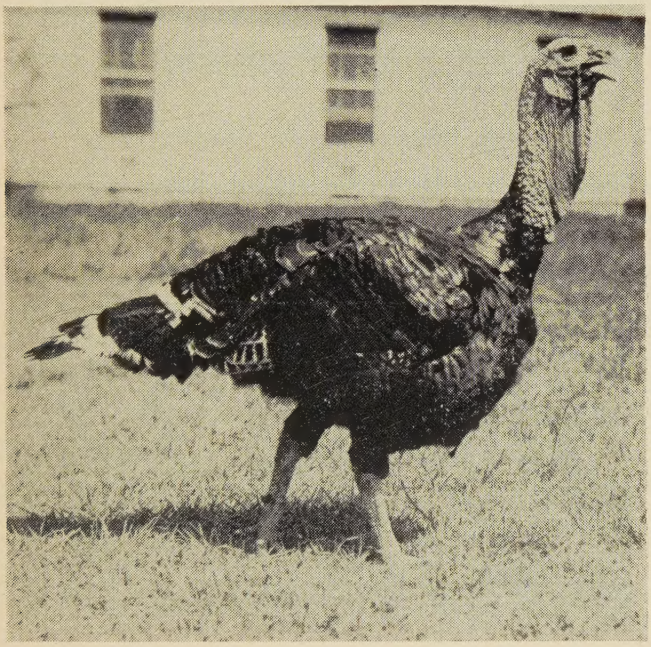

Fig. 1. Shows an unbalanced broad breasted turkey that is so heavy in front that he can not mate satisfactorily.

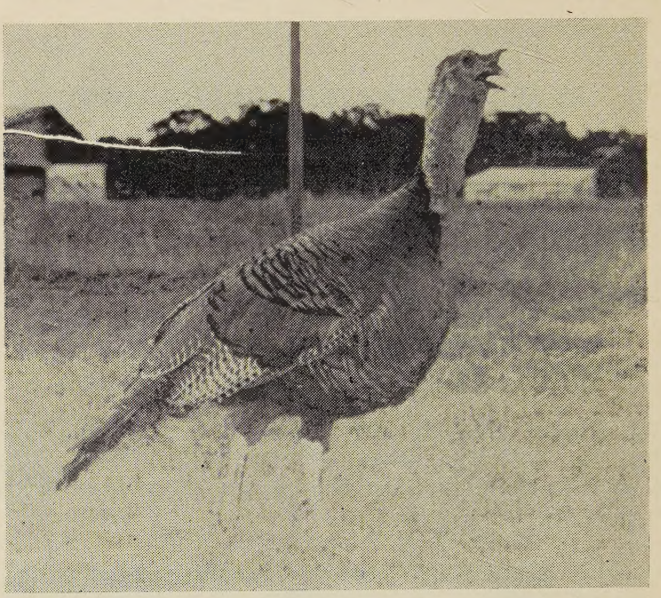

Fig. 2. Shows a well-balanced broad breasted tom which produced over 90 per cent fertility.

Protein Requirements for Growing Chicks

Experiment Station chicks which received rations containing 18 to 20 per cent protein as all-mash feed, gained an average of two pounds each to ten weeks of age. (Fig. 3)

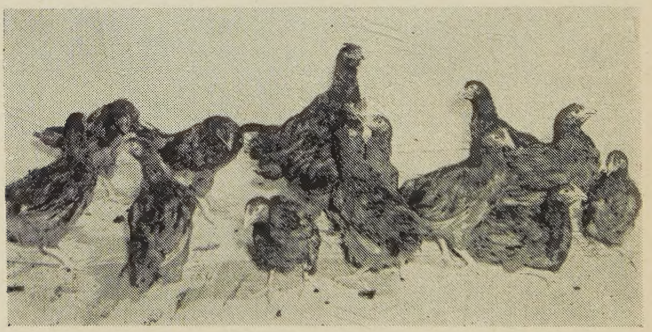

Fig. 3

Chicks receiving a ration containing only 14 per cent protein, gained only 7/8 of a pound to 10 weeks of age. These chicks are shown in Figure 4. Thirty million chicks in the State fed the higher protein feed would gain 33,000,000 pounds more during the ten week period and would be choice marketable chicks which the others would not be; those fed the higher protein feed would make a pound of gain with less feed than those fed the lower protein ration.

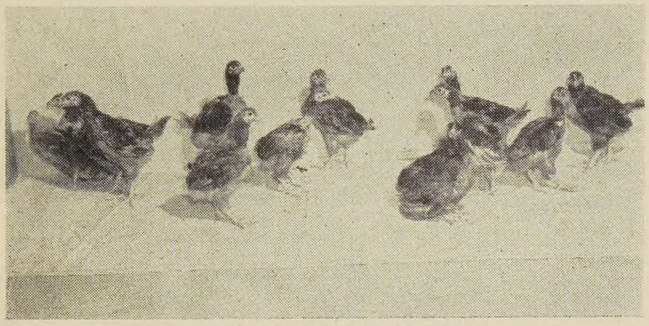

Fig. 4. Not half as good as chicks shown in Fig. 3 due to difference in protein allowance.

Trace Minerals and Vitamins Found in Gray Shorts And Wheat Bran Essential to Growth of Chicks

The Texas Agricultural Experiment Station has proved that gray shorts and bran from hard winter wheat contain trace minerals and vitamins that are vital to satisfactory growth of chicks. Figure 5 shows chicks which received a ration containing 20 per cent of wheat gray shorts. They have good legs, are well feathered and gained 3/8 of a pound more to ten weeks of age than did the chicks shown in Figure 6 which received no wheat gray shorts.

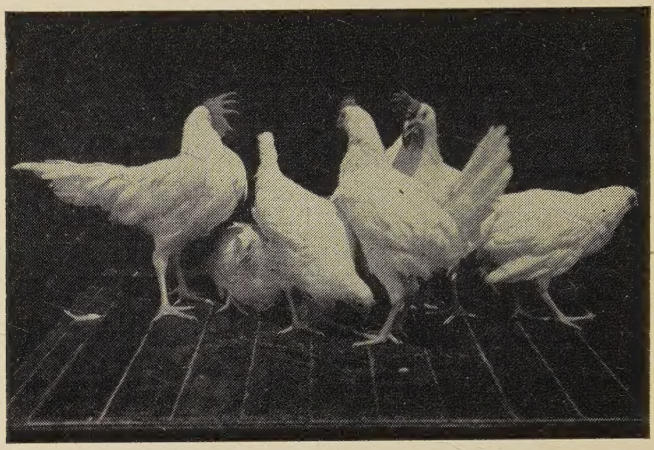

Fig. 5. Wheat gray shorts and bran made a difference.

Fig. 6. Trace minerals were needed.

These chicks shown in Figure 6 have poor legs and feathers and are not good market birds. On the basis of thirty million chicks, this would figure 57,500,000 pounds of choice market birds as compared with 45,000,000 pounds of second grade or unmarketable chicks.

Vitamin "A" in Poultry Feed Prevents Heavy Poultry Losses

The Texas Agricultural Experiment Station has found from experiments that the lack of vitamin A in poultry feeds causes heavy losses with both chickens and turkeys as a result of vitamin A deficiency. These losses include nutritional roup with excessive mortality, limited egg production,

Fig. 7. Had plenty of Vitamin A.

Fig. 8. Low vitamin ration gave disastrous results.

poor hatchability, high mortalty of chicks, and poor growth of chicks. Figure 7 shows a healthy hen which received a high vitamin A ration.

Figure 8 shows a vitamin A deficient hen which received a ration low in vitamin A.

Fig. 9. Typical equipment for broiler production.

Feed Requirements and Cost of Producing Broilers in Gonzales County

It cost 54 producers in Gonzales County an average of 28.2 cents per pound to produce broilers commercially during 1943, but due to increased costs of baby chicks, feed, labor, and other materials, the cost in the early part of 1944 was approximately 31 cents per pound. Feed and baby chicks accounted for more than 70 percent of the total costs. An average of 424 pounds of mash and 53 pounds of grain were fed for each 100 pounds of live broilers raised, or 4.8 pounds of feed per pound of live weight. Broilers were marketed at a weight of approximately 2.2 pounds. Growers purchased an average of 58 chicks to produce 100 pounds of broilers and sustained a death loss from purchase to sale of 21.4 percent. Feed requirements and death losses were both high compared with other commercial broiler producing areas.

Producers may lower costs by using feeding equipment that minimizes feed waste and by providing green vegetation in the yards whenever possible. Care in brooding, feeding, and prevention and control of fowl diseases greatly influenced the death rate and is a means of reducing costs.

Pullorum Testing Laboratory, Texas A&M College

The Pullorum Testing Laboratory operated under the Division of Veterinary Science was set up on the demand of turkey producers in the State of Texas. The tube method is used for detecting carriers of the disease. A fee of five cents per bird is charged for the first test and three cents for each subsequent test during each season. Revenue thus obtained is used to defray expenses of operation.

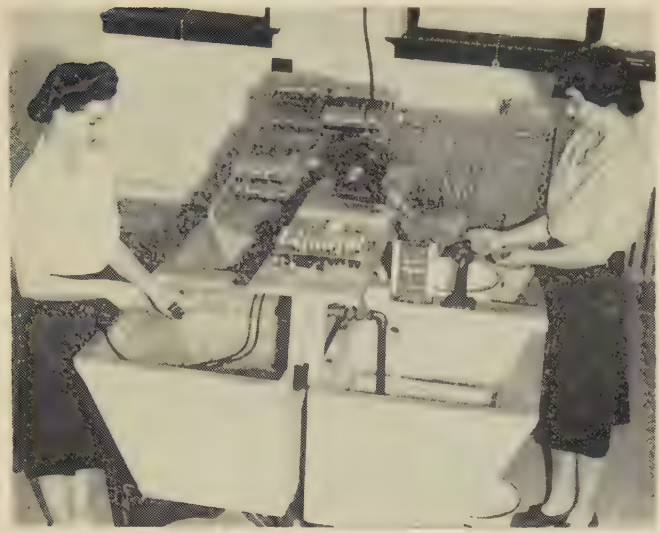

Fig. 10. Many thousands of tubes are necessary to conduct the Pullorum tests. Mechanical contrivances are used wherever possible to speed up the work. Note motor driven test tube brush.

Fig. 11. Reading the tests. Special lighting conditions are necessary to eliminate all possible errors.

Fig. 12. Fast yet accurate work is required to transfer the right amount of serum from each blood sample to the antigen awaiting it in a separate tube. Note field box in background. Each box holds 700 labelled and stoppered tubes and containers for icing.

Liver Flukes in Cattle and How to Control Them by Medication

The common liver fluke, **Fasciola hepatica,** causes much loss in cattle, especially along the lower coast country. Workers at Texas Substation No. 3, Angleton, Texas, have developed a hexachloroethane-bentonite suspension which is an effective drench for the the removal of these parasites from cattle. One dose of hexachloroethane is usually sufficient to kill the adult flukes but young flukes are somewhat resistant to the treatment so that at least two treatments are required to effectively destroy all flukes in the animal. One treatment given in the spring or at the beginning of the dry season and a second treatment in the late fall before the onset of the wet season gives excellent results.

How to Control Liver Flukes by Medication

In cattle, liver flukes can be destroyed effectively and economically with hexachloroethane, a synthetic drug. The drug should be prepared as an aqueous suspension and administered as a drench.

The hexachloroethane suspension is prepared by mixing the ingredients on the basis of one pound of finely ground hexachloroethane (60-mesh size) and 1½ ounces of bentonite (a finely powdered clay) with 25 ounces or slightly over 1½ pints of water. The addition of about one quarter teaspoonful of white flour facilitates the mixing and improves the resultant

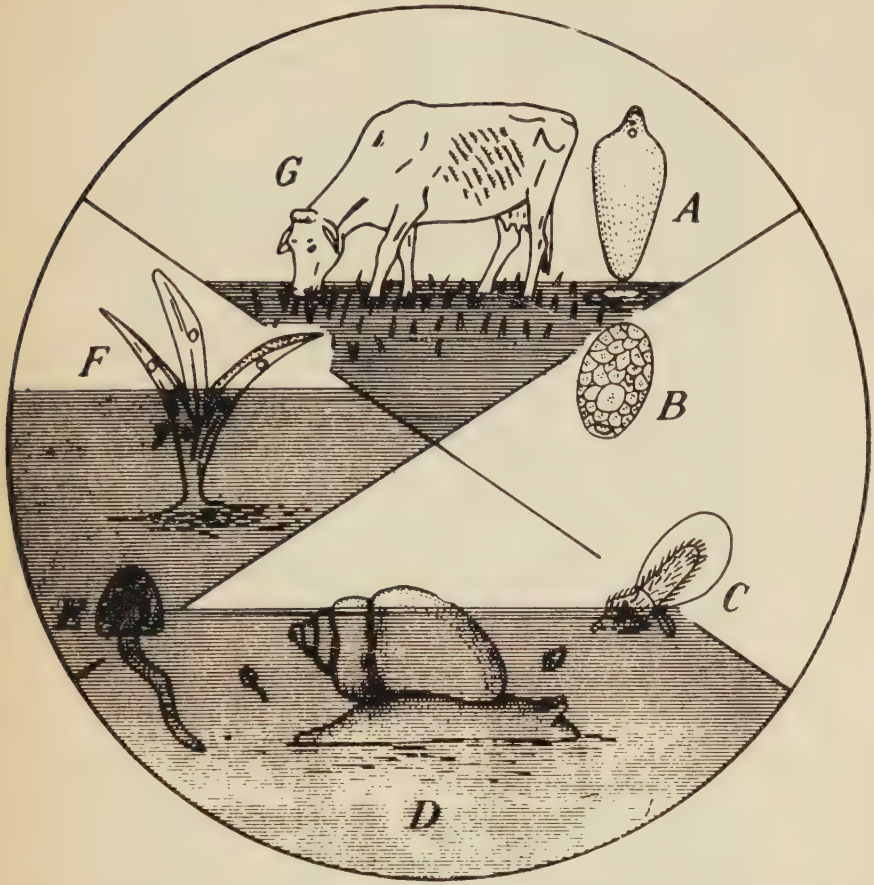

Fig. 13. The above illustrates schematically the life cycle of the common liver fluke, Fasciola hepatica. The adult fluke (A, approximately natural size) in the liver produces many eggs which are expelled to the outside with the droppings. The egg (B, enlarged about 100 times) develops in wet places on the pasture and a free-swimming larva (C, enlarged about 100 times) issues from each normally developing egg. The larva is attracted to certain aquatic snails (D) which it penetrates. After development in the snail, a new type of larva with a tail (E, enlarged about 30 times) emerges and settles on grass (F) or other objects in water and encysts there. Cattle grazing on contaminated pastures (G) swallow the encysted larvae with forage and water. The larvae finally reach the liver of the cattle where they grow into mature flukes (A).

suspension. Mixing should be done with a power-driven apparatus of sufficient speed and force to insure thorough distribution of the ingredients. When mixed in the above proportions, approximately one quart of suspension is produced.

A measured dose of 6½ ounces of the suspension for cattle, and 3¼ ounces for calves over 3 months old, is given by means of a metal dose syringe

of 4-ounce capacity or greater. Calves under 3 months of age need not be treated because any flukes they might harbor would be too young to be killed by the treatment.

Fig. 14. This bull was heavily parasitized with liver flukes and was losing weight even though he was being held in the feed lot.

Fig. 15. The same bull 3 months after treatment with hexachlorethane suspension. Six months after treatment, he was sold to a packing plant for $80.00.

Fig. 16. This bull was heavily parasitized at the time of treatment and the liver was so badly damaged by the activities of the flukes that he was unable to recover even though all the parasites were removed by one treatment with hexachloroethane suspension. He declined steadily and was unable to rise six weeks later at which time he was destroyed. No liver flukes were found at the post-mortem examination.

Keratitis of Cattle

Keratitis or "pink eye" of cattle is a highly contagious disease transmitted from animal to animal by direct contact. Only eye and nasal exudates contain the causative agent. No vectors suspected as being respon-

Fig. 17. This case of Keratitis was experimentally produced using eye and nasal exudates from a field case of Keratitis.

sible for this transmission have yet been incriminated. The disease is prevalent among cattle in the Gulf Coast and other areas during all months of the year showing no regard for breed, age, or sex, The period of incubation, as experimentally determined, varies from forty-eight (48) hours to a week or longer depending upon climatic conditions.

The infection may be unilateral or bilateral developing into two distinct phases—acute and chronic. In the acute stage there is a rise in body temperature of two or more degrees accompanied by marked lacrimation, swelling of the lower lid, photophobia, conjunctivitis, nasal discharge and vascular congestion. The chronic stage begins about the third day, the discharge becomes more purulent, there is opacity of the cornea due to cellular infiltration, which accompanies the inflamatory process; this may lead to ulceration and rupture of the cornea resulting in complete loss of vision.

Early investigations as to the causative agent of this disease pointed towards a Rickettsiae infection. Later experimental work included a bacterial study involving the flora of the conjunctiva of infected cases as they occur under range conditions. As the result of this study from two typical field cases, a pleomorphic diplobacillus belonging to the Genus **Hemophilus** was isolated. (Figure 18.)

The organism was grown on artificial media for twenty-four hours and placed in the eyes of Hereford calves, sheep, goats, and small laboratory animals. To date eighteen (18) calves, one (1) sheep, and one (1) goat have developed typical cases of the disease from this organism while small laboratory animals were resistant.

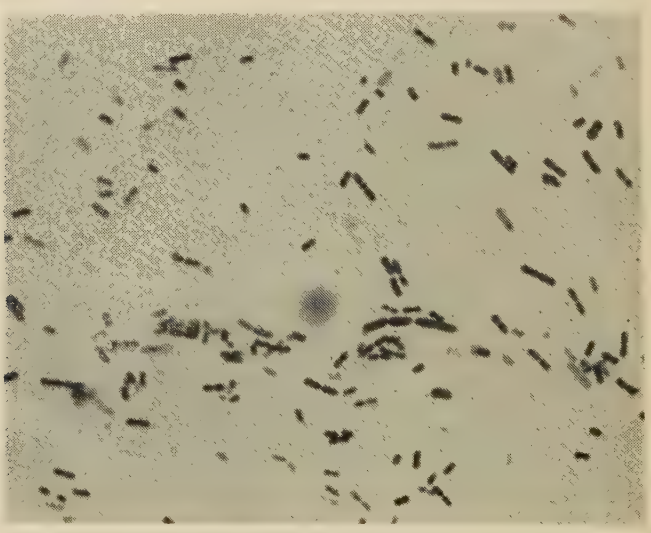

Fig. 18. Pleomorphic diplobacillus belonging to the Genus Hemophilus.

Fig. 19. Typical case of Keratitis produced from a pure culture of the Hemophilus organism.

In Figure 19 the agent has been recovered from the experimentally infected calves and used to reproduce the disease in additional cases. All animals used in this work have been kept in screened stalls and in strict isolation.

The organism responsible for this infection is now in process of being identified.

The presence of antibodies in the blood serum of convalescent animals has been demonstrated, which explains the fact that difficulty has been experienced in reinfecting experimental animals that have recovered from one attack of this disease.

Phosphate Fertilizers Increase Beef Production on King Ranch

Experiments underway on the King Ranch in Brooks County since 1937 have shown the range forage in that area is deficient in phosphorus and also that breeding cattle when fed a phosphorus supplement showed marked improvement not only in weight and condition but in calf production as well.

A study to determine practical methods of supplying additional needed phosphorus to range breeding cows in Brooks County has been underway since July, 1941. Cooperating in these studies were R. J. Kleberg Jr. of the King Ranch and officials of the USDA and of the TVA.

The soil in the area consists of a fine loose sand about 30 inches deep underlain by a tight, gravelly, clay subsoil. There is no water erosion as all of the rainfall which averages about 23 inches annually percolates readily into the soil. This soil, however, if unduly disturbed will drift and form sand dunes. The native vegetation in the area is decidedly deficient

in phosphorus, and during dry years "creeps" is common among the breeding herds. A number of the suckling cows in the control group were "creepy" in the late summer and several, when down, were for a time unable to rise without assistance.

Several sources of phosphorus supply for breeding cows were used.

1. No mineral supplement was supplied for the controls. These produced 417 lbs. calf weight per cow per year average for the first two calf crops.
2. The fertilized pasture received 200 lbs. of 47% superphosphate per acre. These produced 514 lbs. calf weight per cow per year average for the 2 years. This pasture, however, was approximately 50% heavier stocked.
3. On another pasture the animals received bone meal, free access, the year round consuming an average of 48 lbs. annually per head. These produced 448 lbs. calf weight per cow per year average for the 2 years.
4. The phosphorus supplement for the other group consisted of disodium phosphate in the drinking water to supply a minimum of 6½ grams per head daily.

These produced 494 lbs. calf weight per cow average for the 2 years.

Each of the pastures contains 640 acres and with the exception of the one fertilized, are stocked at the rate of 15 acres per cow, the customary stocking rate of the King Ranch. The fertilized pasture is stocked at a rate of 10 acres per cow or 50% above the regular stocking rate based on general pasture experience.

Fig. 20. General view of the experimental area near Falfurrias.

Fig. 21. Showing method used in applying superphosphate directly to the surface of the soil. This experiment used 200 pounds per acre of 47% superphosphate.

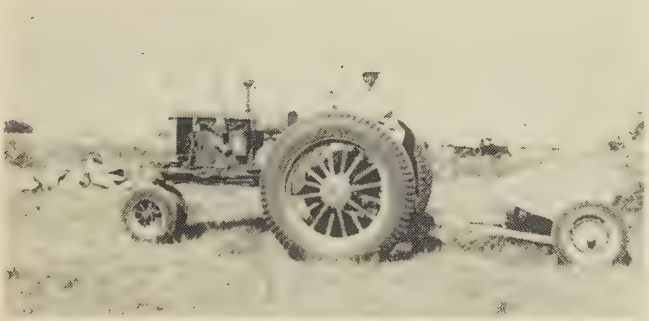

Fig. 22. Fertilizer distributor designed especially for direct application of fertilizer on the King Ranch project.

Fig. 23. Controls: 42 cows on 640 acres unfertilized native pasturage received no phosphorus supplement. Two calf crops, totaling 35,000 pounds were weaned and the weaning weight of the first and second calf crops respectively averaged 500 pounds at 240 days. The calf weight at the time of weaning, prorated per cow, averaged 429 pounds for the first calf crop and 405 pounds for the second calf crop. The average weight of the cows in the control group in 1944 at time calves were weaned was 831 pounds while those on the phosphorus supplements weighed more than 1000 pounds. Calving date 2nd calf crop averaged 51 days later than the first.

Fig. 24. Fertilized pasture: 57 cows on 640 acres native pasture fertilized with approximately 200 pounds of 47% superphosphate per acre have weaned in two calf crops 58,623 pounds calf weight. The weaning weight at approximately eight months of age averaged 544 pounds for the first calf crop and 562 pounds for the second calf crop. The calf weight at the time of weaning, prorated per cow, averaged 506 pounds for the first calf crop and 523 pounds for the second calf crop. The average weight of the mother cows on fertilized pasture in 1944 at the time the calves were weaned was 1,052 pounds. The economy and practicability of this method will depend on the period that the vegetation will continue to respond to the 200 pounds of fertilizer application. Calving date 2nd calf crop averaged only 1 day later than the first.

Fig. 25. Cattle on the fertilized pasture. The calf in the foreground was 5 months old and weighed slightly over 500 pounds.

Methods for the Determination of Essential Amino Acids

The nutritive value of the proteins in foods or in farm feeds used for the production of live stock, depends largely on the kinds and relative amounts of the amino acids which they contain. Research in the nutrition laboratory of the Swine Division has resulted in the development of rapid

Fig. 26. Amino acid assays in the nutrition laboratory of the Swine Division.

and reliable methods for the determination of several different kinds of amino acids in feeds. Heretofore there have been no methods for making these determinations, which were accurate and at the same time sufficiently rapid for practical use. The establishment of the new analytical procedures opens the way for the evaluation of protein feeds on a more sound scientific basis.

There are about ten different kinds of amino acids which are essential for proper nutrition. If any one of these is absent from a protein, or is there only in small amounts, then this protein is of poor quality from the nutritional standpoint. Protein feeds which are deficient in one or more of the essential amino acids can be most economically utilized by combining them with feeds which are rich in these same amino acids. Complete data on the amino acid composition of our feedstuffs will therefore be of practical value to the livestock producer.

The new methods are based on the use of bacteria as test organisms. The analytical procedure may be considered as a feeding test in which countless bacteria in a test tube are used in place of rats or other experimental animals. The liquid medium in the tubes contains an abundance of vitamins, sugar, mineral salts and all other nutrients required by the bacteria except the one amino acid for which the assay is being conducted. The development of the bacteria in the tubes is then strictly dependent on the amount of this amino acid in the test solution. A considerable advantage lies in the fact that the answer can be obtained in two or three days instead of waiting several weeks or even months as is necessary in an animal feeding test.

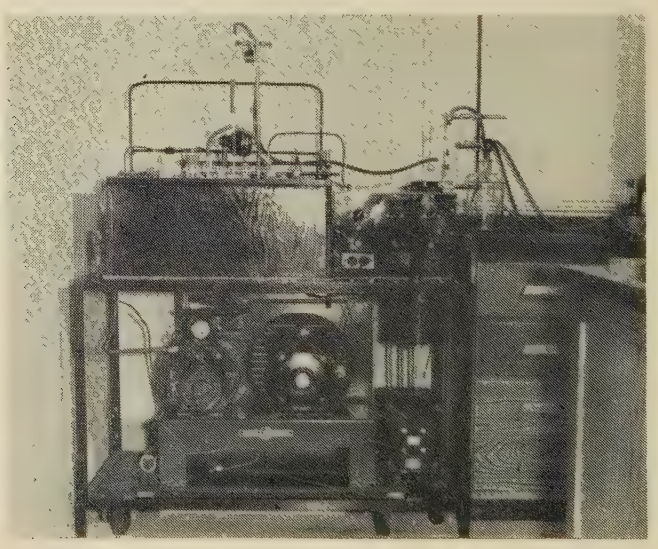

Fig. 27. Research equipment for the separation of amino acids from protein hydrolysates by the use of high voltage electric current.

Fig. 28. Lactobacillus arabinosus, one of the strains of bacteria which are used for the assay of amino acids. Magnified 840 times.

Mechanical Harvesting of Cotton

There was more unharvested cotton in the fields of Northwest Texas on February 10, 1945, than ever known at this date in the history of cotton production for that area. It was estimated that 10 per cent of the crop produced in 1944 was yet to be harvested. For the first time farmers of the Mississippi River Delta and various other localities throughout the Cotton Belt had unharvested cotton in the field when ordinarily they were busy getting a seed-bed prepared for the next crop.

The lack of both labor and machinery for harvesting the 1944 crop was the main cause for the delay in the harvest.

In general, Texas cotton growers in the High Plains of Northwest Texas can count on a certain amount of migrant labor until cold disagreeable weather sets in. But when a good stiff "norther" blows down across the

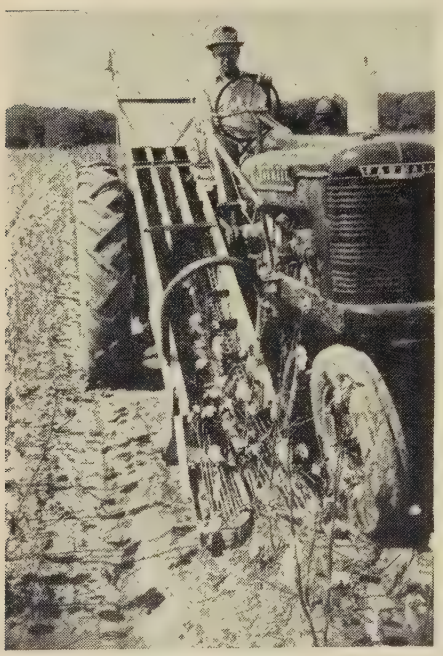

Fig. 29. Close-up of Cotton Stripper Harvester Developed by the Division of Agricultural Engineering.

plains a large part of the migrant labor leaves. Therefore, if a majority of the crop is not harvested by the first good freeze, harvest from that time on is slow, not only because labor is scarce, but also because of more frequent rains and days when little field work can be done.

Cotton growers have been more interested in mechanical devices for harvesting cotton this year than ever before. They have sought out every source where there is a possibility that some type of cotton harvester may be obtained. They have sought the advice of the Experiment Station in figuring out machines that they could make in their own shops.

The average cotton farmer is interested in the performance of mechanical cotton harvesters. He is particularly interested in the difference in cost between hand and machine methods of harvesting and the possible savings obtainable through the use of machinery.

At the Lubbock Substation, cotton was harvested by two men with a 2-row tractor-mounted stripper at more than a bale of cotton in 45 minutes from the time the outfit left the barn until it returned.

Cost of Harvesting a 500-Pound Bale of Cotton (1850 Pounds Before Ginning) in the High Plains Cotton Area—1943

Cost items	Method of harvesting	
	Hand-Snapping	Machine-Stripping
Custom harvesting, $1.50 per 100 lbs.	$27.25	
Hauling at 25 cents per 100 lbs.	4.63	$4.63
Ginning at 30 cents per 100 lbs.	5.55	5.55
Bagging and ties	1.75	1.75
Tractor use		2.00
Use of stripper		2.00
Labor (2 men) at $4 per day		2.00
Total cost	$39.18	$17.93

Fig. 30. A&M College Mechanical Cotton Stripper in operation in field on Main Station Farm College Station. Note clean and efficient job of picking.

At the above cost rates and rates of performance, the total cost of harvesting and ginning a 500-pound bale of cotton machine stripped was 017.93 as compared to $39.18 for the common hand-snapping method. This represents a saving of $21.25 per bale as a result of machine harvesting. Wage rates for pulling bolls would have to fall to 32 cents per 100 pounds of snapped cotton to offset this difference in costs.

Mesquite Eradication

Successful methods of eradicating mesquite depend on destroying the dormant sprout buds on the underground stem of trees. These buds are small wart-like structures that resemble the eyes of an Irish potato and give rise to new growth if the topwood is killed, Figure 1. Their depth ranges from three to as much as eighteen inches below ground, depending upon growth form, soil accumulation, and soil type.

Mesquite may be killed in at least two major ways: (1) by removing the plant deep enough to destroy all the buds as in grubbing by hand or with power machinery; and (2) by applying chemical solutions or oils in such a manner as to kill the dormant buds on the underground stem without removing it.

Removing the topwood at soil level and painting the sapwood of the stump with sodium arsenite has been found to be highly effective and one-half as costly as hand grubbing, provided care is taken to remove all the side branches and to treat all exposed sapwood of the stumps. This method is equally effective during all seasons of the year. Treating stubs and cut-ends of branches extending over three inches from the stump following a tree saw or other similar methods of removal has not been effective.

Kerosene, Diesel fuel or similar oils are effective only when sufficient amounts are applied to the ground and underground stem of mesquite

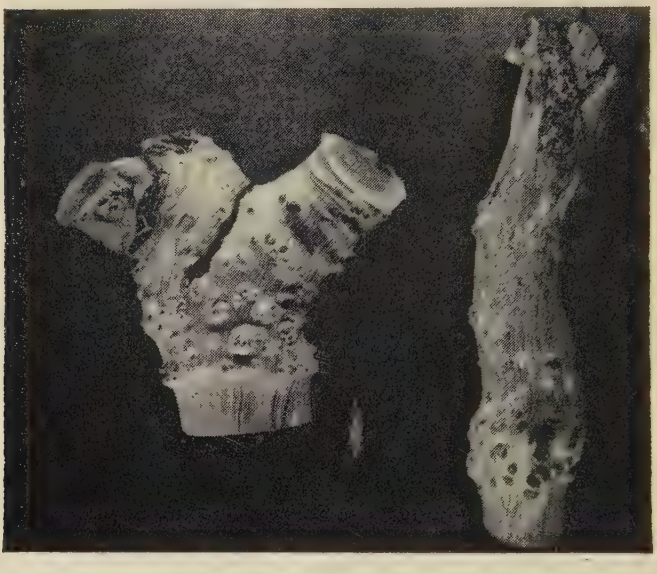

Fig. 31. Stumps of mesquite showing dormant sprout buds on underground stem which give rise to new growth when the topwood is destroyed. Stump on left from upland has buds five inches below ground. Stump on right from bottomland has buds twelve inches below ground level.

Fig. 32. Pasture before cleaning mesquite brush and poisoning the stumps.

Fig. 33. Same pasture as shown in Fig. 32 after 98 percent of the trees were dead from the treatment.

to soak through the bark and into all the dormant buds. Applications made to the above ground growth are wasteful and are not effective unless enough oil is used to reach all the buds. The most effective results are obtained on porous soils when the moisture content of the surface soil is low and the trees are for the most part single stemmed.

A new method which appears promising and one that may greatly reduce the cost of clearing land involves cutting the brush off with a tree saw

Fig. 34. Pasture cleared of mesquite in 1940 had an average of 1067 mesquite seedlings per acre aver two years old in 1943. At each stake there is a seedling that came from seed on the ground or from seed brought in by livestock.

or other means and then killing the trees by spraying the foliage of sprouts with toxic chemicals. Under conditions of high humidity and heavy dews, ammonium sulfamate, sodium arsenite, or sodium chlorate penetrates through the leaves into the underground stem and kills the tree. On the other hand, when the humidity of the air is low and the absence of heavy dews, spraying the sprouts will result in complete failures. This method is still in the experimental stage and is not recommended until it can be used effectively over a wider range of weather conditions.

Any method of eradicating mesquite requires that steps be taken to prevent reinfestation of cleared land by (1) seed and small plants left at the time of clearing, (2) livestock spreading seed from uncleared pastures through droppings, and (3) seed brought in by water, wind, birds, and small animals. Economical control of seedlings may be obtained by removing the young plants a few inches below ground with a grub hoe at intervals of three to five years until the land is cleared.

The Dehydration of Fruits and Vegetables

Twenty-seven varieties of 12 different vegetables were dehydrated under various experimental conditions. The use of airtight containers, the absence of light, packing in an inert gas, and a storage temperature of 45°F were helpful in retarding the rate of deterioration as measured by the cooking quality and the ascorbic acid content of the dehydrated vegetables held in storage.

Magnolia figs exposed to sulphur dioxide for 1½ hours and dehydrated at temperatures not to exceed 150° were equally as good in flavor and texture, but not as good in appearance as sun dried figs.

Fig. 35. Experimental dehydrator. Note opening for trays of vegetables. The gas furnace with thermostatic control is above and to the left. A tray of vegetables which has just been blanched is being weighed before being placed in the dehydrator.

Breeding and Health Programs Produced Silver Medal Dairy Animals

Ten Silver Medals for meritorious production have been made by the Agricultural Experiment Station dairy herd during the past two years and a State Champion cow in the senior two-year old division was attained in 1944. The herd is composed of approximately 115 head of registered Jersey cattle, 70 of which are of milking age. In addition to serving as the test animals in a number of feeding experiments to ascertain the nutritive value of many Texas feeds for milk production, this herd is one of the highest producing herds in the State and in the entire South. For the past two years the herd has averaged slightly more than 10,000 pounds of milk and 500 pounds of butterfat, mature-equivalent 305-day basis. This represents an increase in production of about 66 per cent over the average production of 6,000 pounds of milk and 300 pounds of butterfat which was produced 12 to 15 years ago when the Station herd was considered excellent. The herd is free of Bang's disease and has been tubercular accredited since 1930.

Fig. 36. Some queens of our dairy herd.

Emerald Sweetclover

Emerald sweetclover is a many stemmed, leafy, green seeded type of annual sweetclover. It was developed by the selection among the progeny of a hybrid between Hubam and a many stemmed, crown branching, white blossomed sweetclover.

Because of its many stemmed, leafy, crown branching habit it is an excellent plant for grazing. It probably will not make as many pounds of

Fig. 37. Showing the many fine stemmed character of (A) Emerald sweetclover as compared to the coarser, fewer stemmed (B) Hubam clover.

Fig. 38. Showing a group of (A) Emerald sweetclover plants as compared to (B) Hubam clover containing the same number of plants.

air dry material per acre as Hubam, but the quality of forage and the plants ability to recover after being grazed are characters in its favor. Emerald clover can be grown in Texas wherever Hubam is adapted. Seeds of this variety will be available in limited amounts through commercial channels for planting in the fall of 1945.

Sweet Sudan Grass

Sudan grass was brought to this country as a plant immigrant in 1909 and has since that time developed into the most important annual pasture grass in the Southwest as well as over most of the Nation. Practically no breeding work was done with Sudan grass until 1934 when the Texas Station began a breeding program through hybridization with one of the Sweet Sorghums. The plant breeding problem was to compound a new synthetic variety by transferring the characters of sweet and juicy stem, non-shattering seed, disease resistance, and the distinctive sienna glume color from Leoti sorgo while retaning the grassy characteristics of Sudan grass. The mode of inheritance of these five characters was determined and their incorporation into a new variety through crossing, backcrossing and selection in the greenhouse and in the field over a period of seven or eight years has been accomplished. The new variety is called Sweet Sudan Grass and it is both sweet and juicy like the sweet sorghums.

Disease resistance from the Leoti parent has been bred into this new variety and while it is not immune to the common foliage diseases, this resistance enables it to remain green and growing and to furnish green grazing several weeks later in the fall than does the old variety. Sweet Sudan grass is also more resistant to chinch bugs.

A distinctive sienná or reddish glume or seed color common to the Leoti sorgo parent has been incorporated, not only as an excellent marker for

Fig. 39. Field Sweet Sudan Grass.

Fig. 40.

the new variety but as a practical means whereby contamination with Johnson grass and mixtures with other sorghums can readily be detected.

In growth habit and production the old and the new varieties are strikingly similar. Sweet Sudan produces more seed and a better quality of forage than common Sudan grass but grows off a little slower in the spring and matures a few days later.

The sweet and juicy stalks of Sweet Sudan grass makes it more palatable to livestock as shown by planting the old and new varieties on adjoining areas and allowing cattle and hogs to graze them at will. As the breeding work progressed selection was made in rows well grazed. Differential grazing is more marked as the crop becomes older and advances toward maturity. Many instances have been observed where cattle showed their preference for Sweet Sudan grass which was grazed down close to the ground while the common Sudan grass was sparsely grazed by comparison.

The Experiment Station plans to maintain at Chillicothe a source of pure Foundation seed for continued distribution to interested farmers.

Breeding New Types of Rhodes Grass Resistant to Lower Temperatures

Rhodes grass was first introduced into Texas at Substation No. 12, at Chillicothe, in 1909, but it did not withstand the winter temperatures, therefore, it was not considered an important pasture plant for that region. It was tried at the substations at Angelton and Beeville in 1914. About the same time the King Ranch and other interested farmers and ranchers in south Texas made trial plantings and found it well adapted to their

Fig. 41. Broadleaf type of Rhodes grass. The leaves are much broader and longer than the regular type and the seed stalks are shorter.

climatic conditions, but found that it usually winterkills at temperatures from 15 to 18 degrees F. In an effort to extend the region of its adaptation from South Texas to colder areas, a series of experiments was started at College Station in 1937.

In 1938 a large number of individual Rhodes grass plants were planted in the nursery. There was no damaging winter temperature in 1939, but in January 1940, a minimum temperature of 8 degrees F. was recorded. Some plants survived this temperature and the most vigorous plants were selected and propagated.

Cold resistant strains are being subjected to more rigid winters farther north in Texas, principally at Denton. Many of the selections look promising and are in the process of seed increase, but there will be no seed available for distribution until 1946.

Fig. 42. Narrow leaf type of Rhodes grass. Note the compact nature of the plant. This type is desirable as a grazing type while the broadleaf type is better for hay.

New Types of Grain Sorghum Suitable for Combine Harvesting

The recent development of dwarf combine grain sorghum varieties suitable for planting in practically all parts of the State has brought about an important and revolutionary change in the growing of this valuable grain crop in Texas. This change has been a rapid one because as late as 1941 not 10 per cent of the grain sorghum crop was planted to combine varieties while in 1944 more than 85 per cent of the crop was grown from sorghums of this kind. Formerly grain sorghums were harvested with a row-binder and threshed out of the bundle or hand headed from the

Fig. 43. Field of Plainsman ready for machine harvesting. New combine varieties are increasing acreage and production of grain sorghum and saving labor and costs of handling for farmers.

standing stalks with a pocket knife at the rate of an acre or two a day. This has been the mode of harvesting even though the crop was planted and cultivated with a two-row or a four-row tractor outfit. The shortage of farm labor as a result of the war has made it necessary to turn to dwarf combine varieties that can be harvested nd threshed with machinery direct from the standing stalks in the field, and at the rate of 20 to 40 acres per day.

Sorghum breeding work by the Texas Station has resulted in the development of a number of new and satisfactory varieties adapted to machine harvesting, and several of these have been distributed and are now widely grown by farmers. Plainsman, Caprock and Bonita are three of these varieties. Plainsman and Caprock were developed from hybrids between kafir and milo and were named and distributed in 1940. They have red seed and a dwarf, stout stalk which will stand up in the field and await machine harvesting. They have 14 to 15 leaves, mature in 105-110 days and resemble a double dwarf kafir in growth habit and appearance. Bonita is also a hybrid, closely resembling Hegari which was one of the recurring parents. It has white seed, a compact head and dwarf stalk, and is earlier and more certain of production than Hegari. All three of these varieties are resistant to pythium root rot.

Other new combine varieties for special purposes are being developed through hybridization and will soon be ready to release to farmers. Among these are a double dwarf waxy endosperm variety free from objectional plant pigments and producing grain suitable for the manufacture of tapioca starch; a double dwarf, white-seeded variety better adapted for use in ordinary starch manufacture; and dwarf and double dwarf combine varieties of Shallu for the humid areas along the Gulf Coast. Plant breeding in the development of combine varieties of grain sorghum having special adaptations is resulting in a greatly expanded acreage and production of

this grain crop in Texas. It has made it possible for the farmer to handle large acreages with machinery throughout the raising of the crop, thus saving in labor and cost of production. Combine varieties have brought the grain sorghums into the field of mass production and for the first

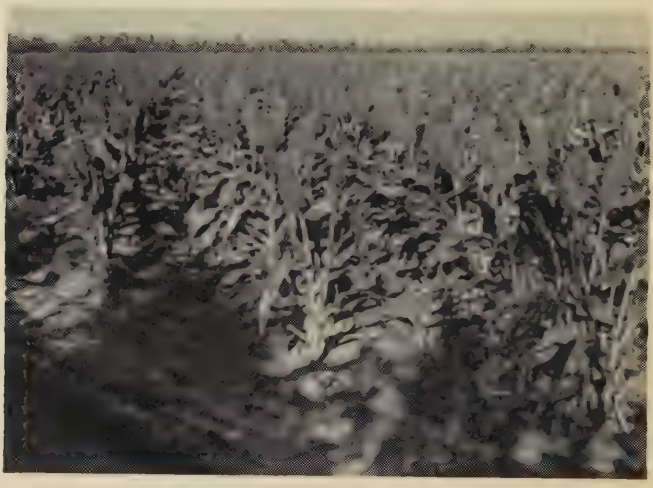

Fig. 44. Field of Caprock ready for machine harvesting.

Fig. 45. Typical stalks of Caprock (left) and Plainsman (right). Plant breeding has developed uniform and dwarf, stout stalked varieties adapted to machine harvesting.

time in their long history they have finally reached the stage where they can be grown on a large scale farming basis as a cash crop similar to wheat and corn.

Legumes Increase the Yield of Cotton and Corn

The growing of adapted legumes in cropping systems has greatly increased the yields of cotton and corn on the sandy soils in eastern Texas

Fig. 46. Hairy vetch fertilized with 300 pounds of 0-8-4 fertilizer per acre; average yield 1.31 tons air-dry matter for the six years 1937-42; added an average of 100 pounds of nitrogen to the soil each year.

Fig. 47. Cotton following fertilized vetch (shown in Fig. 1), average yield 248 pounds of lint per acre.

Fig. 48. Cotton which received no treatment; average yield 178 pounds of lint per acre.

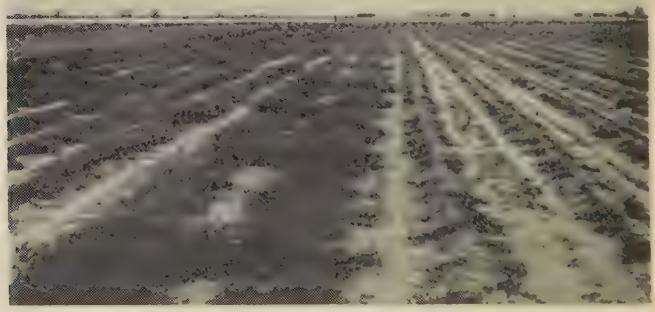

Fig. 49. Vetch planted on ridges; left, fertilized with superphosphate; right, vetch not fertilized.

and in the Blackland belt. On the sandy soils the results show that superphosphate must be used with the legumes to obtain the best results.

On Lufkin fine sandy loam at College Station, the plowing under of vetch fertilized with superphosphate and potash increased the yield of cotton about 40 per cent and unfertilized vetch increased the yield only 6 per cent during the eight years, 1937-44.

At Nacogdoches, cotton after vetch fertilized with superphosphate and potash made an average yield of 286 pounds of lint per acre during the

four years 1941-44, which was 75 per cent more than the yield of 163 pounds of cotton which received no treatment. On the other hand, the plowing under of unfertilized vetch increased the yields of cotton only 40 per cent.

In a two-year rotation of cotton and corn at Tyler in which vetch was planted as a winter green-manure crop after corn, cotton following vetch fertilized wih superphosphate and potash produced about 80 per cent more lint per acre than untreated cotton after corn. The second year, corn following cotton on vetch land produced 27.7 bushels per acre or twice as much as untreated corn after cotton.

At Denton, in North Texas, the plowing under of fall-planted legumes in early spring has given good increases in the yield of cotton in favorable years, as in 1943, but over a period of years the practice has not been profitable. The winter legumes, as bur clover, hairy vetch, and Austrian winter peas, usually do not make sufficient growth early enough to prepare a good seed bed for an early planted spring crop as cotton or corn. The over-seeding of sweetclover in the spring on small grain, in rotation with cotton and corn, however, has given good results.

At Temple, in the Blackland Prairie, cotton in a two-year rotation with Hubam clover (harvested for seed) produced an average yield of 315 pounds of lint per acre during the five years 1940-44, while continuous cotton produced only 165 pounds. In a two-year rotation of corn and Hubam clover (for seed), corn made an average yield of 37.4 bushels, and continuous corn yielded 27.2 bushels.

Fig. 50. Hubam clover increases the yield of corn on blackland soils. These pictures show 1944 results. The top 3 photographs were taken on June 9. Their respective treatments and corn yield are underneath. Continuous corn producing 20.1 bushels is shown at left; corn-cotton rotation producing 26.2 bu. at center, while the corn-Hubam rotation shown at right made 34.4 bu. per acre.

Breeding Small Grains for Rust Resistance

The development of rust resistant varieties of wheat, oats, barley, and flax by the Texas Agricultural Experiment Station is rapidly converting the Coastal Prairie into a small grain producing area.

Fig. 51. A field of Rustler oats in southern Texas,—one of the rust resistant varieties developed by the Texas Agricultural Experiment Station.

Fig. 52. Five thousand new wheat varieties undergoing preliminary trials in a wheat nursery in southern Texas. The development of rust resistant varieties has extended wheat production to the Gulf Coast. The new Austin wheat developed for South Texas conditions came out of these nursery tests.

Fig. 53. Hardy and non-hardy flax varieties in nursery test at College Station, Tex. Winter hardy, rust resistant strains of flax recently developed promise to extend flax production from the Gulf Coast north to the Central Blacklands.

Combine Harvesting and Drying Rough Rice in Texas

Binding and threshing of rice is being replaced as rapidly as possible by the use of combines and driers in Texas. Rice growers have found that combining and drying requires only about 20 to 30 percent of the labor needed to harvest by the old method of binding, shocking, and threshing.

In 1943, growers using 14-foot self-propelled combines used an average of 2.65 man hours of labor per acre for all harvesting operations including drying and trucking from drier to market. In contrast, a total of more than 13 man hours of labor was required per acre to bind, shock, thresh rice,

Fig. 54.

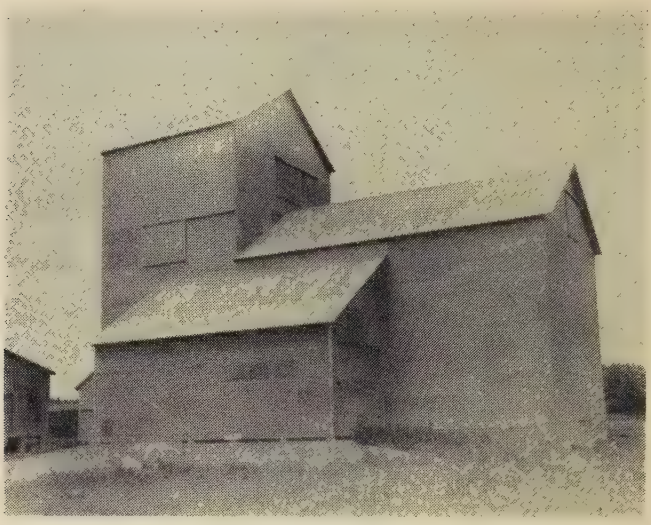

Fig. 55. At the end of the 1943 rice harvesting season, 17 mechanical rice driers were in operation in Texas. These driers had an average drying rate of 48 barrels of dry rice per hour with an estimated seasonal capacity of 30,000 to 60,000 barrels. Driers, as they were operated during the 1943 season, required 0.048 man hours of labor per barrel of rice dried with an average drying cost of 0.13 cents per barrel.

During 1944 the number of large mechanical rice driers in Texas more than doubled and while the present commercial rice drier operates successfully, there is little doubt that many improvements can be made.

and truck it to market. Farmers using 6- and 7-foot pull-type combines and handling bulk rice needed 3.09 man hours of labor per acre for all harvesting operations.

Due to high moisture content, rice harvested with a combine must be artificially dried before it can be stored or marketed.

Investigations have proved that rough rice of even very high moisture content can be successfully dried with mechanical driers if the proper procedure is followed in the drying operations. With the present commercial rice driers, the practice is to give the rice a series of successive dryings between which there are periods of storage in which the mosture content of the kernels becomes more equalized.

New Combine types of Rice have recently been developed at the Rice Experiment Station at Beaumont namely, Texas Patna and the new Bluebonnett variety. Seed of these varieties are being rapidly increased and are now available.

Promising Berry Selections

Three seedlings of the fifth generation of a cross made years ago between the Nessberry and the wild dewberry are very promising. Two of

these have special merit for the home garden and one looks like a superior commercial berry. All are still carried under number.

R 40-4 is one of the earliest berries known and fills the place between the strawberry crop and the time present varieties of dewberries and blackberries ripen. It has good size (note the natural size photograph) and is productive. R 40-51 is one of the largest of this type of fruit. The illustration shows that four fruits lengthwise and seven fruits in width fill the six-inch rule. While not all of the fruits attain this size, all are large and a few are larger than this. Finally R 40-202 has definite commercial possibilities because of its productiveness and the fact that it stands handling.

All of these selections have exceptionally vigorous shoots up to 15 feet long under the growing conditions at College Station. They like full sun and prefer no competition from trees or shrubs. They are well adapted and fully hardy. The fruit is relished fresh and has sufficient tartness to make excellent jam and jelly. Tests are underway to determine their range of adaptability.

Fig. 56. R 40-4. One of the earliest berries, it immediately follows the strawberry season in the home garden. Natural size.

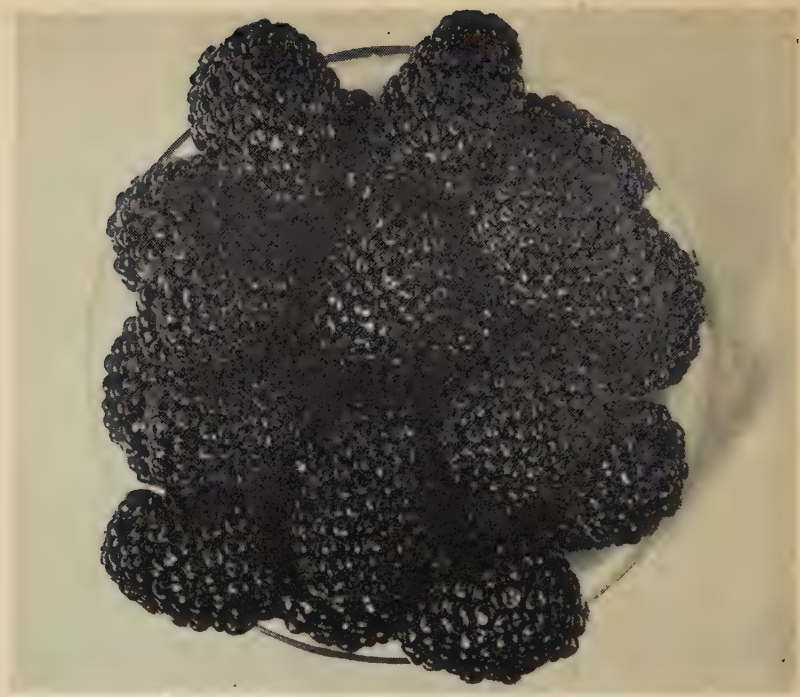

Fig. 57. R 40-202. This is promising new commercial berry. It has size, commercial quality and good yield. Natural size.

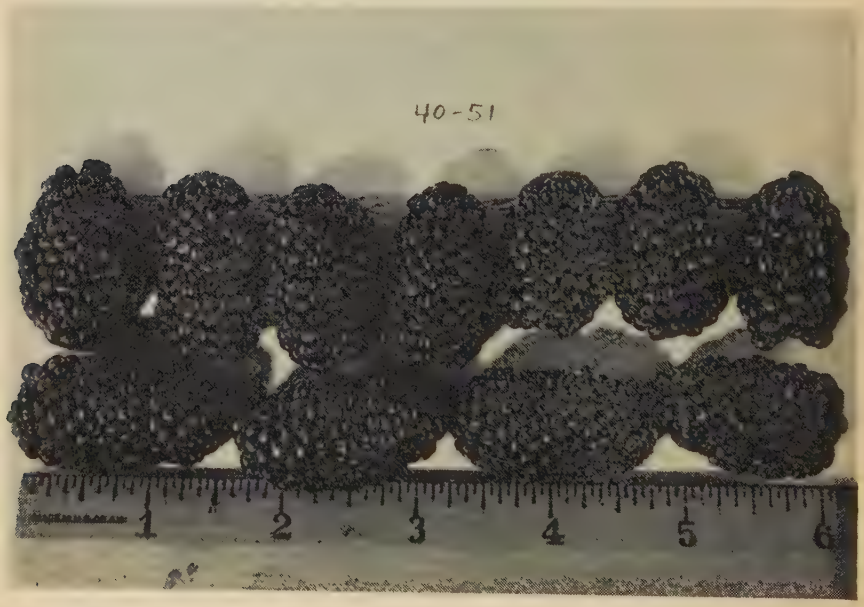

Fig. 58. R 40-51. A home garden berry of immense size and good quality.

An Improved Strain of Early Onion Texas Grano

Fig. 59. The actual yield was at the rate of 724 bushels per acre.

Fig. 60. Typical Early Grano Onion.

A new strain of Early Grano onion, the Texas Grano, has been developed by Mr. L. R. Hawthorn, former horticulturist at the Winter Garden Substation. The Texas Grano has been shown to be superior in earliness and uniformity of maturity and a heavy producer under Southwest Texas conditions. Maturity is reached the first week in April, a week ahead of Yellow Bermuda and two to several weeks earlier than commercial Grano strains.

Foundation stock seed has been planted and mother bulbs for the production of certified seed will be produced in 1945. Several plantings have been made and a limited supply of certified seed should be available in 1946.

Texas Cantaloupe No. 1 Resists Mildew and Aphids

A new variety of cantaloupe, resistant to downy mildew and aphids has been developed at Substation No. 19, Winter Haven, and it is to be released to growers by the end of June, 1945.

Fig. 61. Fruit of Texas Resistant Cantaloupe No. 1.

The cantaloupe is of the shipping type with firm rind and moderate netting, small in size, early in maturity, orange flesh color, and with sweet, pleasing, slightly musky flavor.

The new variety has been bred for resistance to downy mildew and the melon aphid, two of the most important enemies of this crop. It has

been derived from a cross between a resistant West Indies cantaloupe and an improved strain of Hale's Best. In small trials throughout the Winter Garden region it has withstood the downy mildew in spring and summer plantings and has produced fruits of high quality while the common Hale's Best varieties grown side by side have gone down with the disease. Although not immune to this disease, the resistance of this new variety is sufficiently high to recommend it for planting in the relatively dry sections of South Texas. The resistance of this cantaloupe to aphids (plant lice) makes dusting for the control of this pest unnecessary.

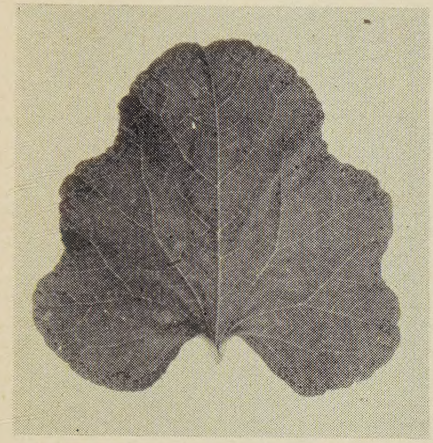

Fig. 62. Showing mildew and Aphid Resistant Leaf of Texas Resistant Cantaloupe No. 1.

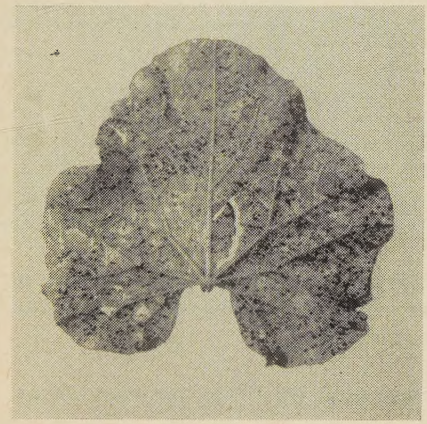

Fig. 63. Typical Leaf of Hale's Best Cantaloupe (a susecptible variety) showing Aphids (Plant Lice) damage and Downy Mildew Spots.

Fig. 64. Control of black spot of roses with sulphur-copper dust. On the left is a dusted rose plant and on the right is a non-dusted plant, showing the improvement in growth, foliage, and weight of bushes by dusting.

Blackspot Control

The rose black spot fungus, **Diplocarpon rosae**, causes serious defoliation of bushes in the commercial rose fields near Tyler, Texas. As a result of experimental work, a sulphur-copper fungicidal dust has been developed which protects the rose bushes from this disease. Dusted bushes retain more of their leaves, are less susceptible to die-back, and show a larger percentage of first-grade plants than those raised in non-dusted fields. Dusted bushes, because of sufficient food reserves, retain their vigor following storage or transplanting.

Essential Oil Crops for East Texas

Very promising results have been obtained in a search for essential oil crops at the Tyler substation. This work has been done by the late Dr. J. C. Ratsek, Horticulturist at the Tyler station in cooperation with

Professor J. H. Sorrels of the Engineering Experiment Station. **Rosa centifolia**, grown for this purpose in Europe, was found to be entirely satisfactory under conditions in East Texas. Of greater probable value are three weeds native to this section of the State. These are the Horsemint **(Monarda fistulosa)**, Mintweed **(Pycnanthemum albescens)** and Goldenrod **(Solidago odora)**. All three are perennial and can be readily grown. They are usually propagated by divisions. Goldenrod yielded at the rate of 9½ tons per acre the second season. It was found to contain 2.8% oil. The search for other oil bearing plants is being continued.

The oil can be extracted in a fairly simple still (Fig. 65). This consists of a galvanized sheet iron box which holds the plant material. Live steam is introduced through the bottom and extracts the oil as it passes through the plants. It goes out through he pipe at the top and is condensed to liquid form in coils surrounded by cool running water in the small tank at the left. The oil and water are then collected in the large bottle beneath the tank. With the exception of the small steam plant needed to operate the still, it could be made by hand on any farm with a small cash outlay.

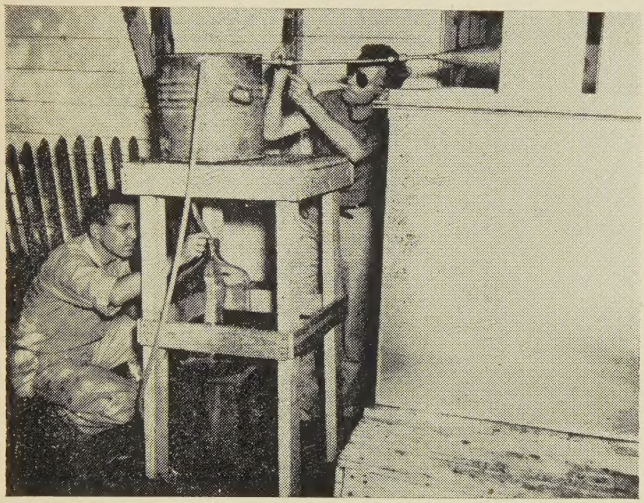

Fig. 65. Type of portable still required for the extraction of essential oils on the farm, operated experimentally by Prof. J. H. Sorrels (left) and the late Dr. J. C. Ratsek (right).